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ABSTRACT

Depression therapy literature cites the importance of self-concept in formulating therapeutic strategies. Traditional depression measures catalog a client's symptoms, but fail to tap the structure of dysfunctional thoughts and judgments that form the client's self-concept. Vector-product multidimensional scaling was used to develop a measure of depression defined by the pattern of relationship judgments formed by relating self-concept to other concepts significant in depression. A control group (N=17) and a depressed group (N=10) rated pairs of descriptive self-image concepts from 1 to 9 according to how similar they judged each pair to be. These similarity ratings were analyzed through principal components analysis into factors representing the dimensions underlying each subject's self-concept. Cognitive maps were generated for control subjects, the average control subject, and the average depressed subject. Cognitive maps derived from averaged relationship judgments revealed significant differences between self-concepts of control and depressed subjects; individuals' discriminant function scores correctly categorized 96% of the subjects into the correct groups. For depressed subjects, the configuration of pair-concept relationship judgments provided insight into the interrelationships between the positive and negative aspects of self-concept which form the unique pattern that constitutes depression. (Author/NRB)

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A Multidimensional Scaling Approach to the Assessment of Self-Concept in Depression[1]

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Running head: Multidimensional Scaling

[1] The research described in this paper was directed by Dr. G.M. Diekhoff, Midwestern State University.

A Multidimensional Scaling Approach to the Assessment of Self-Concept in Depression

Introduction

Reference to the importance of utilizing self-concept in formulating an effective approach to behavioral change is found throughout the literature (Foreyt and Rathjen, 1978; Mahoney, 1974; Orlinsky and Howard, 1978). Particularly in the study of depression, the nature of the self-concept is critical, since it is the perception of one's self as inadequate or worthless that is at the core of the various types of depression. Moreover, it has been postulated that a therapist-induced change in the way a client perceives him- or herself is the key factor in generating the changes in affect and behavior observed during therapy for depression (Beck, 1979; Foreyt and Rathjen, 1978). As aids in therapy, measures of depression exist, both as scales embedded within multiphasic inventories (e.g., Scale 2, MMPI, 1943) and as separate scales (e.g., Beck Depression Inventory, 1967). However, these scales are limited in their usefulness in that they only indicate the relative absence or presence of the

various symptoms of depression while not providing much insight into the specific nature of a client's depression. In addition, inferences drawn from the statistical manipulation of the data obtained from such traditional measures do not lend themselves to conceptualization within multidimensional, spatial-mathematical models and are thus of limited heuristic value. Such conceptualization is possible, however, using more recent multidimensional scaling methods. To provide information beyond that available from traditional scales, the present investigation will employ vector-product multidimensional scaling in developing a measure of the self-concept in depression.

The study of the self-concept in depression through multidimensional scaling will provide a succinct means for the therapist to assess whether a client is depressed and, if so, to gain insight into the specific nature and causes of his or her depression as well as provide a starting point for therapeutic intervention. (Simply trusting observational or self-report data is unreliable, since the client may be consciously or unconsciously masking his or her depressive symptoms). Furthermore, a test developed through multidimensional scaling tech-

niques, when administered at various points throughout therapy, will provide valuable information on the client's progress and on the efficacy of the therapeutic methods employed. Although the present study does not by itself attempt to perfect such an assessment device, it is seen as an important first step toward that goal.

A final rationale for the present research is that in small clinics and in small college counseling centers there is a lack of money, clerical help, and professional time to administer the longer forms of personality tests such as the MMPI or the Rorschach Test. Quick assessment methods such as the proposed measure of depression will circumvent these limitations.

Multidimensional Scaling. In multivariate research, multidimensional scaling has been used for two related purposes (Nunnally, 1978). In one type of study the investigator wishes to learn something about the dimensions that subjects employ in making cognitive or affective judgments regarding sets of objects or stimuli. In the second type of study the physical or overt dimensions that subjects use in making judgments are known beforehand; the investigator is interested in learning how these dimensions are actually involved in

the psychological processes underlying their judgments. Nearly all methods of multidimensional scaling are based on the subjects' responses in terms of their judgments of similarity or differences of stimuli. (It is generally assumed and has been shown that subjects can approximate interval scales in making their judgments [Carroll, 1967.) Vector-product multidimensional scaling, the most powerful method, can be applied to many different types of stimuli where it is logical to have subjects make judgments concerning the similarity of a set of stimuli taken in all possible pairwise combinations. Subjects are asked to assign numerical values to each pair of stimuli, reflecting the degree of similarity or dissimilarity they perceive between members of the pairs. These numerical ratings can be considered to be equivalent to correlation coefficients; thus, the set of ratings obtained from a subject can be regarded as comprising a correlation matrix, which can be directly submitted to principal components analysis. The factors that emerge indicate the dimensions underlying a subject's similarity judgments on the pairs of items, and the factor matrix indicates the locations of the stimuli on the underlying dimensions.

In addition to the factor matrix derived for each subject in a study, the average similarity ratings obtained from a group of subjects yields a factor matrix that can be considered either to represent the group as a whole or to represent the similarity judgments of an average individual. This matrix for the average subject in a group can then be compared with that of any given subject in the group or with that of any given subject in another group.

Multidimensional scaling has been used in studies investigating such areas as the cognitive structures of preschool children (Fenker, 1976), concept learning in an introductory course (Weiner, 1974), and structures of interpersonal relations (Wish, 1976). A study by Partington (1970) investigating the self-concepts of alcoholics illustrates the use of multidimensional scaling methods similar to those employed in the present research. Forty control and forty alcoholic subjects were asked to make similarity judgments among all possible pairs of a set of stimulus people representing a broad range of personality types or marker stimuli (e.g., "independent person," "dependent person," "warm person," "cold person," etc.). The target stimuli were "sober self" and "high self." Two sets of 40 intercorrelational matrices representing similarity judgments

were obtained, and from these an average matrix for each group was formed, from which two factor matrices were derived. The "cognitive maps" formed using these factor matrices showed the position of the target stimuli relative to the marker stimuli, and it was possible to infer how subjects evaluated themselves by simply studying these spatial configurations. The maps revealed significant differences between the self-concepts of alcoholics and normals, as well as providing valuable therapeutic information concerning the nature of the alcoholics' self-concepts.

Method

Overview. The purpose of this pilot study was to examine the nature of the differences of self-concept judgments between depressed patients and normal or control subjects, with the expectation that multidimensional scaling would be useful in discriminating unknown cases into depressed or nondepressed categories as well as in clarifying the nature of an individual's depression. The procedure required subjects to rate pairs of concepts, descriptive of possible self-images, according to how similar or related they judged them to be on a scale from 1 to 9: that is, from practically no similarity to high

similarity. These similarity ratings were analyzed into factors representing the dimensions that underlie each subject's self-concept. "Cognitive maps" were constructed for individual control subjects, individual depressed subjects, the average control subject, and the average depressed subject.

Subjects. Twenty-seven subjects were included in the study, with 17 in the control group and 10 in the depressed group. Control subjects were volunteers from one section of the general psychology course at Midwestern State University who were told that the purpose of the study was to determine the nature of their self-concepts in relation to several other concepts. This group consisted of 7 males and 10 females, ranging from 19 to 29 years of age, and is seen as providing a baseline against which the depressed group can be compared. The depressed group consisted of adult individuals who were diagnosed as depressed by a clinical psychologist or a physician and who were participating in a continuing out-patient therapy program.

Selection of concepts. The selection of those concepts which appeared in the final relationship judgment form (i.e., the matrix of stimulus concepts given to all subjects) began with gleaning traditional descriptions or symptoms of

depressed behavior from the literature (Beck, 1967; Seligman, 1976; Zung, 1980) and from established personality tests such as the Minnesota Multiphasic Personality Inventory (Hathaway and McKinley, 1943) and the California Personality Inventory (Gough, 1957). These 54 concepts were listed in bipolar fashion under the general heading of "concepts" while opposite each pair under the heading of "ratings" appeared a rating scale from 1 to 9, with 1 through 3 listed as least useful, 4 through 6 as moderately useful, and 7 through 9 as most useful in describing and diagnosing depression. This list of concepts was distributed to three clinical psychologists who were asked to rate each bipolar pair according to its usefulness. Those pairs which received ratings from 7 through 9 by two of the three psychologists were included in the final matrix of relationship judgments. The original set of 54 concepts was thus reduced to 14 concepts.

The matrix format and accompanying instructions chosen for use in administering the 14 concepts (91 concept pairs) to subjects are found in Figure 1. The relationship judgments were administered to the control subjects as a group

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Insert Figure 1 about here

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in their evening class and to the individual depressed subjects in the clinicians' waiting areas prior to their therapy sessions. After filling out a matrix of relationship judgments, each subject in both groups responded to a second set of concept pairs (Figure 2), a subset of the concept pairs contained within the matrix. This second set of ratings enabled assessment of the reliability of each subject's judgments. This second set of concept pairs appeared along the diagonal of the first set of judgments, beginning with "current self--other people" and ending with "happy--past self."

Treatment of data. For the control and depressed groups two sets of relationship judgments were gathered for each of the 27 subjects: (1) the matrix of judgments and (2) the 13 pairs of concepts on the diagonal used in assessing reliability of judgments as described above. For each subject the following measures were computed:

Insert Figure 2 about here

Pearson Product Moment Correlation between each subject's original relationship judgments and subsequent relationship judgments (which served as an index of judgment reliability); the mean score for each subject's original

relationship judgments; and the standard deviation of each subject's original set of relationship judgments. Additionally, every matrix of relationship judgments was treated as a correlation matrix and submitted to a principal components analysis (vector-product multidimensional scaling). For each group of subjects the means were computed for each cell of the individual matrices. These matrices of mean judgments comprised the average control relationship judgments and the average depressed relationship judgments. These averaged judgment matrices were used to derive factor matrices for the average control and depressed subjects, which in turn generated cognitive maps for the average control subject and the average depressed subject.

Results

On the cognitive map for the average control subject, two definite clusters of concepts emerged (see Figure 3).

Insert Figure 3 and Figure 4 about here

Cluster 1 (CS 1) included the concepts "other people," "interest in sex," "adequate," "active," "happy," and "desired self." As anticipated, centered within this "non-depressed" cluster was the concept "current self." Cluster 2 (CS 2) contained the concepts "hopeless," "useless," and

"tired"; and, as expected, this "depressed" grouping was clearly separated from CS 1. In the cognitive map for the average depressed subject (see Figure 4) the concept "current self" was centered within the concepts that comprised CS 2, and the concept "desired self" appeared in CS 1. Other concepts that were used in the judgment matrices--"anger," "dying," "family," and "past self"--appeared as expected in the two clusters on the average maps, but were discarded from the computation of CS 1 and CS 2 because they showed excessive variability on the individual maps.

From the individual raw data several statistics were computed for use as variables in a stepwise discriminant analysis. The sum of the self-reported similarity scores between the concept of "current self" and the concepts contained within each of the two subjectively identified clusters was used to compute two composite scores representing distances of current self from CS 1 and from CS 2. As shown in Table 1, other variables used in the stepwise

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Insert Table 1 about here

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discriminant analysis included the canonical correlations derived by comparing the spatial location of all the concepts from each individual map to the spatial location of

those concepts from the average control map, which produced a canonical correlation in the primary dimension (CC 1) and a canonical correlation in the first orthogonal dimension (CC 2). Typically, canonical correlation analysis attempts to establish a linear combination from each set of variables in such a fashion as to achieve maximum correlation between the two linear combinations, yielding several pairs of linear combinations or canonical variates (Nie, et al., 1975). In this study, however, the canonical correlations themselves were used as

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Insert Table 2 about here

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discriminating variables in the stepwise discriminant analysis for each group (Shikiar, 1974). Results of the stepwise discriminant analysis indicate that of the two canonical variates, CC 1 and CC 2, used in the analysis, CC 2 served as a weak but nonetheless statistically useful variable to enable maximum discrimination between the groups and to classify subjects correctly into groups. An additional variable in the stepwise discriminant analysis was the number of factors generated by each individual's map with an eigenvalue greater than 1 (FS). The mean of each individual's reported concept scores ($\bar{X}$) and the variance (s^2)

were also used as variables in the stepwise discriminant analysis.

The Univariate F-Ratio with 1 and 25 degrees of freedom (see Table 2) shows that of the variables only CS 1 with F=74.31 and CS 2 with F=22.08 are independently significant ($p<.001$). For variable CS 1, group 1 (control) scores ranged from 32 to 52 with $\bar{X}=38.88$ and $s=5.94$. Group 2 (depressed) scores for CS 1 ranged from 6 to 31 with $\bar{X}=16.60$ and $s=8.04$. For variable CS 2, group 1 scores ranged from 3 to 22 with $\bar{X}=11.12$ and $s=5.96$. Group 2 scores for CS 2 ranged from 11 to 27 with $\bar{X}=21.80$ and $s=5.20$.

A stepwise discriminant analysis using all the variables and setting FIN=1.5 and FOUT=1.5 showed that by adding s^2 and CC 2, F was increased by 2.74 and 1.66 respectively (see Table 2). FIN and FOUT levels determine which variables meet the minimum criteria for inclusion in a stepwise discriminant analysis and which particular variables are retained when they contribute significantly to the separation between groups as the analysis procedes through all the variables. This linear combination of variables,

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Insert Table 3 about here

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resulting from the stepwise discriminant analysis with

weight values found in Table 4, correctly categorized 100% of subjects in both group 1 and group 2. With the value of FIN and FOUT raised to 4, and when CS 1 was used alone or in combination with CS 2, 100% of the subjects in group 1 and 90% of the subjects in group 2 were categorized correctly. With selected concept pairs, test-retest reliability was .37.

Insert Table 4 about here

Discussion

This multidimensional scaling method was devised to assess the specific nature and causes of depression as expressed by the formation of an individual's cognitive structure. A subject's cognitive structure was derived by recording his or her judgmental responses to stimulus concepts, and the subsequent map of a subject's cognitive structure of the spatial relationship of these concepts yielded both practically and theoretically useful information. This approach provides a quick but thorough assessment for depression, less time-consuming than traditional measures, for both practitioner and client. The results of the measure provide insight into the spatial

distance a client perceives his or her current self to be from his or her desired self, the positive or negative aspects of his or her self-concept, particular relationships which may contribute to the depression, and the areas in which therapy may concentrate. The administration of the instrument during this pilot study took approximately 20 minutes, which suggests that the test could be administered either initially or throughout therapy in an amount of time significantly shorter than that required to administer more traditional measures such as the Beck Depression Inventory or the MMPI. Thus, the method provides a relatively quick means of assessing the nature and extent of a client's depression at the time of his initial interview and of monitoring the efficacy of the therapeutic approach during the remainder of therapy.

It is likely that the instrument's utility at this early stage of development is as an adjunct to more established assessment devices. Despite the relatively minimal reliability demonstrated by the prototypic version of the measure, the cognitive maps provided by the depressed subjects' responses to the stimulus concepts are valuable indicators of factors underlying and accompanying their depressions. With future revisions of the directions to make

clearer to the client what he or she should do with this unconventional format and with further standardization of administration procedures, it is expected that the reliability of the test will increase to a level comparable to levels of reliability found in more traditional measures. In addition, the power of the discriminating variables CS 1 and CS 2 empirically showed excellent discrimination in the ability to place an individual into the appropriate depressed or non-depressed group. The stepwise discriminatory analysis of the effectiveness or the original discriminating variables indicated that the first set of composite scores on the concepts as noted above served as a powerful discriminator between depressed and non-depressed subjects. The clinician, without the aid of a computer, can quickly observe an individual's numerical responses to these concepts to see whether a client's composite score lies within a range of scores indicative of depression. This method of utilizing a judgmental response style to stimulus concepts can be expected to elicit fewer successful faking responses than those methods calling for endorsements (Kusyszyn, 1968) and is capable of being utilized by a therapist of any theoretical persuasion. Those persons who experience severe, chronic

depression or who have intellectual deficiencies may have difficulty, as with most assessment tools, in understanding the directions or may be unable to maintain the attention span necessary to complete the matrix. In these instances, another means of measurement is more appropriate.

Although this study has limitations in scope and development due to its exploratory nature, it represents an attempt to fulfill a continuing need to discover the specific nature and causes of depression and to clarify what role an individual's perception of self plays in depression. Additionally, it suggests further investigations utilizing a multidimensional scaling approach: it may be useful to investigate the spatial movement of current self toward desired self in client's cognitive maps, comparing the relative efficacy of various systematic therapeutic approaches. It may be worthwhile also to monitor accompanying components of depression such as physiological or psychomotor behaviors to assess whether or to what extent correlation exists between the shifting of self-concept and changes in these behaviors. Moreover, the matrix format could be modified easily so that during post-therapy a client could utilize the instrument for self-monitoring purposes to enable him or her to become more rational and

objective regarding his or her behavior in those situations or relationships which previously contributed to his or her depression. For the purpose of studying self-concept in general, worthwhile investigations might include repeated testings of a specific target population to evaluate self-concept stability and to assess more generally the conceptual space of the self-concept.

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Table 1

Spatial Coordinates of Concepts on a Two-Dimensional Map of the Average Control Group Subject and the Average Depressed Group Subject

Stimulus concepts	F matrices			
	Factor 1		Factor 2	
	Control	Depressed	Control	Depressed
Current self	.819	.199	.210	.798
Other people	.754	.807	.326	.255
Active	.822	.802	.189	.178
Tired	.341	.224	.629	.805
Interest in sex	.783	.817	.166	.119
Adequate	.820	.827	.158	.125
Desired self	.801	.726	.127	.131
Useless	.134	.107	.848	.859
Anger	.197	.212	.780	.728
Dying	.189	.188	.766	.749
Family	.762	.599	.241	.409
Hopeless	.129	.087	.806	.896
Happy	.900	.868	.126	.039
Past self	.665	.718	.348	.359

Table 2

Means and standard deviations for each group on the discriminators; Univariate F-Ratio with 1 and 25 degrees of freedom for each variable

	Means		Standard Deviations		
	Control	Depressed	Control	Depressed	F(1,25)
Cluster 1	39.882	16.600	5.947	8.044	74.315*
Cluster 2	11.118	21.800	5.967	5.203	22.084*
$\bar{X}$	4.689	4.330	0.575	0.342	3.133
s^2	12.162	7.891	14.473	2.003	0.848
Eigenvalue 1.0	4.353	4.200	0.702	0.789	0.273
Canonical correlation 1	0.881	0.844	0.174	0.060	0.425
Canonical correlation 2	0.188	0.273	0.143	0.196	1.701

* $p<.001$

Table 3

Summary table of the stepwise discriminant analysis

Discriminant function	Eigenvalue	Canonical correlation
1	4.057	0.096

Wilks' lambda	Chi-square	DF	Significance
0.1978	34.845	7	0.001

Table 4

Standardized discriminant function coefficients of the statistically significant variables based on 1 discriminant function to classify future subjects into depressed or nondepressed groups.

	Function 1
Cluster 1	.85886
Canonical correlation	-.11840
Variance	.17964

Figure 1

The final matrix of relationship judgments

Figure 1

Listed below are pairs of concepts. Please assign a number between 1 and 9 to each pair to indicate how SIMILAR or DISSIMILAR you feel the concepts are in that pair. A rating of 1 means that there is practically no similarity between the two concepts in the pair. A rating of 9 means that the two concepts are highly similar.

You should use all of the numbers at least one time. Also, you may use any of the numbers more than once. If you are unsure of what number to assign to a particular relationship, respond on the basis of what understanding or hunches you have.

	current self	other people	active	tired	interest in sex	adequate	desired self	useless	anger	dying	family	hopeless	happy	past self
current self	10													
other people	—	10												
active	—	—	10											
tired	—	—	—	10										
interest in sex	—	—	—	—	10									
adequate	—	—	—	—	—	10								
desired self	—	—	—	—	—	—	10							
useless	—	—	—	—	—	—	—	10						
anger	—	—	—	—	—	—	—	—	10					
dying	—	—	—	—	—	—	—	—	—	10				
family	—	—	—	—	—	—	—	—	—	—	10			
hopeless	—	—	—	—	—	—	—	—	—	—	—	10		
happy	—	—	—	—	—	—	—	—	—	—	—	—	10	
past self	—	—	—	—	—	—	—	—	—	—	—	—	—	10

Figure 2

The subset of concepts found within the relationship matrix and used to assess reliability of Ss judgments.

Figure 2

Listed below are pairs of concepts. Please assign a number between 1 and 9 to each pair to indicate how SIMILAR or DISSIMILAR you feel the concepts are in that pair. A rating of 1 means that there is practically no similarity between the two concepts in the pair. A rating of 9 means that the two concepts are highly similar.

You may use any of the numbers more than once. If you are unsure of what number to assign to a particular relationship, respond on the basis of what understanding or hunches you have.

current self	_____	other people
other people	_____	active
active	_____	tired
tired	_____	interest in sex
interest in sex	_____	adequate
adequate	_____	desired self
desired self	_____	useless
useless	_____	anger
anger	_____	dying
dying	_____	family
family	_____	hopeless
hopeless	_____	happy
happy	_____	past self

Figure 3 The average depressed group subject cognitive map based on multidimensional scaling of the mean score judgments of stimulus concepts.

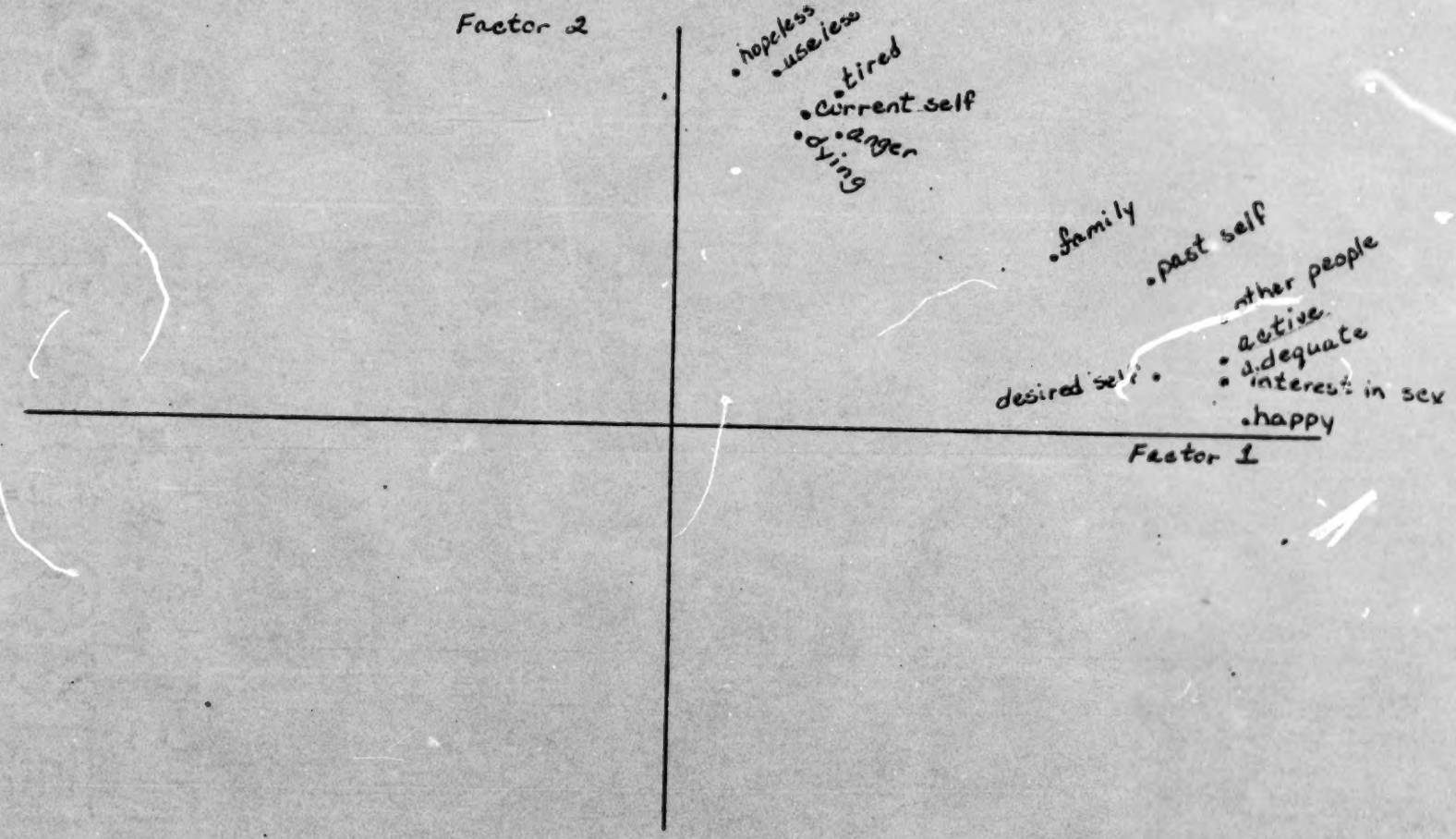
Factor 2
hopeless
useless
tired
current self
dying
anger
family
past self
other people
active
adequate
interest in sex
desired self
happy
Factor 1

Figure 3.

Figure 4 The average control group subject cognitive map based on multidimensional scaling of the mean score judgments of stimulus concepts.

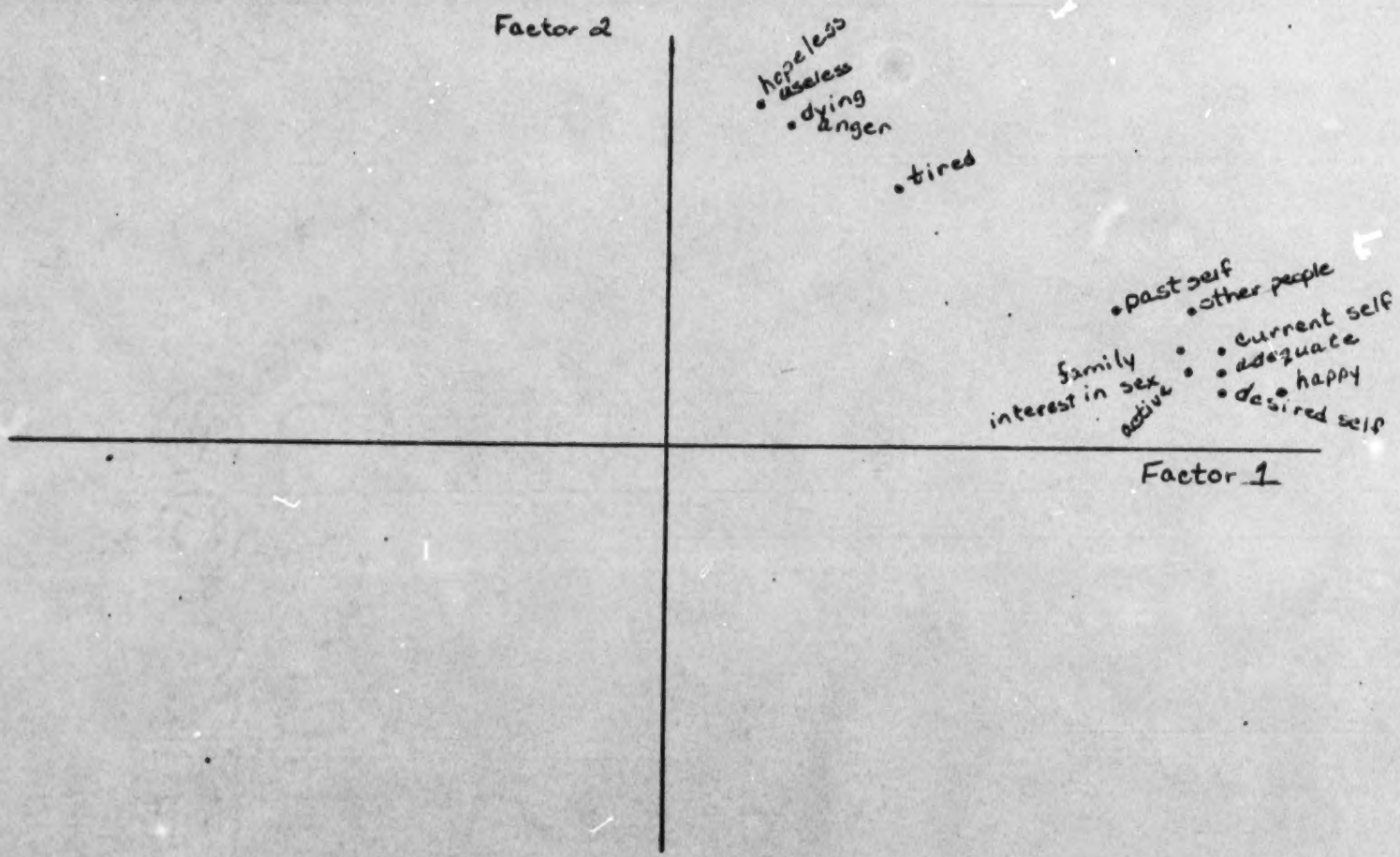
Factor 2
hopeless
useless
dying
anger
tired
past self
other people
current self
family
interest in sex
adequate
happy
desired self
Factor 1

Figure 4